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Case Report

Endodontic retreatment of an autotransplanted lower first premolar: a case report

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Abstract – A 24-year-old female with no contributory medical history had been treated by orthodontic alignment and transplantation of the lower left first premolar to the upper left first premolar site to correct for congenitally missing upper premolars. Subsequently, the transplanted premolar was treated by conventional endodontics and apical surgery for persistent periapical periodontitis over a span of 12 years. A combination of conventional endodontic retreatment and periapical surgery resulted in periapical healing. This case outlines the need for careful preoperative case assessment.

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Key words: autotransplantation; endodontic retreatment; periapical surgery; periapical cyst

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Transplantation is the transfer of a tooth from one alveolar socket to another, either in the same or different individual (1). If the transfer is from the alveolar socket to another in the same individual it is termed autotransplantation. The success rate of an autotransplanted tooth differs widely, and it has been reported from 0 to 100% (2, 3). The cause of failure may be because of a number of conditions such as root resorption, apical periodontitis, lack of root formation, displacement from the alveolus, periodontal disease and failure in primary healing. Other factors such as donor tooth type, stage of eruption, age of the patient, bone type, periodontal status, risk factors such as smoking, and the surgical technique and skill can contribute to the prognosis (4, 5).

Failure of conventional root-canal treatment commonly results from intraradicular infection which may be because of numerous factors such as inadequate control and elimination of infection, poor access cavity design, inadequate canal instrumentation and obturation, missed canals and coronal leakage (6). Additional causes of persistent periapical pathology after conventional root-canal treatment in well-treated cases may be an extraradicular infection such as *Actinomyces* sp. and *Arachnia propionica* (7, 8), a foreign body reaction (9–12), or the presence of a true cyst (13, 14). The treatment alternatives for an endodontic failure are conventional endodontic retreatment, endodontic surgery, a combination of both, or extraction of the tooth.

This paper presents a clinical report of an autotransplanted tooth that required non-surgical and surgical interventions to treat the tooth subsequent to the development of procedural problems and associated periapical pathology.

Report

A 24-year-old female was referred to the discipline of Endodontics from the discipline of Oral and Maxillofacial surgery for treatment of a recurrent periapical abscess associated with the upper left first premolar tooth. Her medical history was non-contributory. The patient was a regular visitor to her general dental practitioner, and she was prepared to undergo further endodontic treatment.

On questioning the patient it became evident that the tooth had a unique history. In May 1990, the patient was referred to an orthodontist for orthodontic treatment of a mild Class 3 dental and skeletal malocclusion. She had congenitally missing upper right first premolar and upper left first and second premolar teeth with lower arch crowding. Orthodontic treatment planning was carried out in consultation with an oral and maxillofacial surgeon regarding the missing upper left premolars. In order to establish a

balanced occlusion, the lower left first premolar was extracted and transplanted to the upper left first premolar site by an oral and maxillofacial surgeon during September 1991. Subsequently, conventional endodontic treatment was carried out by a dentist. A review appointment in 1993 revealed that clinically the transplanted tooth was symptom free, had normal mobility and no sign of periapical bone loss. The patient reported in May 1997 with an abscess in the region of the upper left first premolar, and an apicectomy procedure with a root-end filling was performed in June 1997 by an oral and maxillofacial surgeon. A diagnosis of periapical granuloma was established histologically. In January 2001, the patient was referred for an endodontic opinion regarding the tooth that was painful and had a recent episode of swelling of the buccal gingiva.

On extra- and intraoral examination, no abnormalities were detected except that the upper left first premolar was discoloured, slightly palatally placed and had a discharging sinus on the buccal mucosa approximating the position of the apex (Fig. 1). The tooth was not tender to percussion. The dentition was molar Class 1 occlusion with a skeletal Class 3. The overbite and overjet were within normal limits. The periodontium was generally pink and healthy except at the mid-buccal of the tooth where there was pocketing of 3 mm but no bleeding on probing. Sensibility testing was carried out on the neighbouring teeth and all reacted within normal limits.

Radiographic examination revealed loss of lamina dura and an area of periapical bone loss 6 mm in diameter associated with the upper left first premolar (Fig. 2). The root canal appeared to be well-obturated and a root-end amalgam filling was in place. A periapical radiograph taken in 1991 revealed that the original root-canal system consisted of two canals (Fig. 3). A radiograph taken in 1992 suggested that only one canal was instrumented and obturated at that time (Fig. 4).

Fig. 1. Intraoral photograph demonstrating discloured upper left first premolar with associated draining sinus in buccal mucosa.

Fig. 2. Periapical radiograph taken at time of presentation. Periapical pathology is evident.

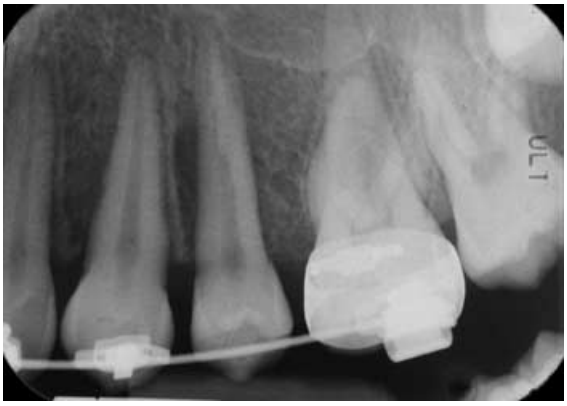

Fig. 3. Periapical radiograph taken immediately after autotransplantation of the lower left first premolar into the upper left first premolar area. The reduction in size of the pulp space in the midroot area identifies that the coronal canal separated to two apical canals.

Fig. 4. Radiograph taken after initial endodontic treatment. The obturation pattern indicates that one canal was instrumented and obturated. The entrance to the second canal was obturated with sealer.

A diagnosis of chronic periapical periodontitis with draining sinus was made, and it was decided to perform orthograde endodontic retreatment in order to locate the second canal, explore for root fracture, and evaluate healing of the sinus subsequent to cleaning and shaping the root canal. If healing was evident within 1–2 weeks then conventional retreatment would be completed and tooth 12 put under a review period. If no healing of the sinus took place, it was planned to perform conjunctive apical surgery and review.

An access cavity was prepared, the gutta-percha and sealer was removed with hand files and chloroform and the root explored for a palatal canal and for root fractures. An entrance to a palatal canal could not be located and no fractures were detected. The canal was instrumented in conjunction with 2.5% sodium hypochlorite irrigation and an ethylenediaminetetraacetic acid preparation (RC Prep, Premier Dental Products Company, PA, USA), and then dressed with calcium hydroxide and temporized with a resin reinforced zinc oxide eugenol material (IRM, Dentsply Caulk Milford, DE, USA). At 3 weeks, the draining sinus was still present, the canal preparation was optimized, dressed with calcium hydroxide and the access temporized with IRM. On the next visit, the root canal was obturated by lateral condensation of gutta-percha and sealer (AH plus, Dentsply Detrey, Konstanz, GmbH, Germany) and the tooth temporized with glass ionomer cement (Fuji IX, Shofu Corporation, CA, USA). Under local anaesthesia, a full thickness mucoperiosteal triangular flap from the mesial of the upper left canine to the distal of the upper left first molar was raised for periradicular surgery. Soft tissue was curetted from the periapical area and sent for histopathological diagnosis. The retrograde amalgam filling was removed using ultrasonic instruments and the root face slightly bevelled to facilitate location of the palatal canal. Both the buccal and palatal canals were prepared with an ultrasonic root-end preparation tip (Satelac Inc., NJ, USA) and the retroprep filled with mineral trioxide aggregate (ProRoot, Dentsply Maillefer, Ballaigues, Switzerland). The flap was approximated and stabilized with three 4/0 black silk sutures. A postoperative periapical radiograph was taken (Fig. 5), and the patient was instructed on postoperative care.

Sutures were removed on the third postoperative day, the area was comfortable with minimal swelling, the draining sinus had resolved, and soft tissue healing was satisfactory. An occlusal composite restoration was placed. Histopathology revealed that the specimen was a periapical cyst with areas of abscess formation (Fig. 6). At 1-month recall, the tooth was symptomless with good gingival healing and contour. At 6-month recall, the tooth was symptomless with evidence of periapical bone healing (Fig. 7), at

Fig. 5. Postoperative periapical radiograph.

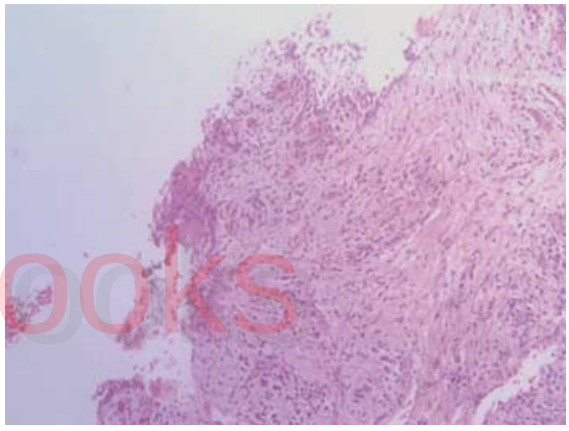

Fig. 6. Photomicrograph of a histological section demonstrating a non-continuos epithelial lining and inflamed connective tissue capsule consistent with the appearance of a radicular cyst.

Fig. 7. Six-month follow-up radiograph shows bone regeneration.

Fig. 8. Twelve-month follow-up radiograph demonstrating almost complete radicular bone healing.

12-month recall periapical bone healing was almost complete (Fig. 8).

Discussion

The prognosis for tooth autotransplantation depends on various factors such as operator surgical technique, whether the apex is open or closed, extra-oral handling and time, type of splinting, establishment of ideal occlusion, endodontic technique and maintenance of good oral hygiene all contributing to success. Lundberg & Isaksson (5) indicated that the prognosis for transplantation to the premolar area was considered to be significantly better than transplantation to the molar area because of variations in bone morphology, vascularity of the recipient bed and surgical access. In the case presented, it was evident that the autotransplantation technique was successful as the tooth did not exhibit signs attributable to transplantation failure, e.g. root resorption (15). It was clear, however, that the persistent pathology was because of failure of the endodontic treatment.

Preoperative assessment is an important component of treatment planning and a thorough knowledge of the morphology and anatomy of the tooth is essential to the success of endodontic treatment. In the present case, the history of persistent periapical pathology stems from an inadequate preoperative assessment that did not identify that the tooth to be transplanted had a complex root-canal system characterized as a large coronal root canal that split in the midroot area into two finer canals (Fig. 3). The reported incidence of more than one canal in mandibular premolars ranges from 0 to 25.8% (16, 17). Without identifying the canal morphology preoperatively, it is highly likely in a case such as this that the palatal canal would be missed, as the morphology of the canal orifice would not indicate to the clinician that two canals were present. The consequence of not treating the palatal canal allowed an intraradicular infection to establish which sustained the pathological process in the radicular tissues. However, other factors influenced the disease process in this case.

Failures in root-canal treatment mainly occur because of the presence of bacteria in the root-canal system (18). Non-surgical endodontic retreatment is the treatment of choice over surgery and is indicated when instrumentation of the root canal is possible and where there is evidence of a technical deficiency or the presence of clinical or radiographic signs or symptoms of failure, e.g. pain, swelling, sinus tract, persistent radiolucency (19). Studies indicate that retreatment success is higher if non-surgical techniques are performed and that the success of surgery is higher when it is supplemented by non-surgical retreatment (20–22). For non-surgical endodontic retreatment the reported success rates vary from 60 to 98% (23, 24). Sjogren et al. (24) reported that for roots with periapical lesions which were previously filled and retreated, the success rate was 62%, while 98% of the roots which underwent non-surgical retreatment to correct technical deficiencies healed. From a retrospective point of view, it would have been better evidence-based treatment if non-surgical retreatment had been carried out in preference to surgical treatment when the tooth first displayed periapical pathology.

Effective chemo-mechanical debridement of the root-canal system usually brings about the resolution of acute signs/symptoms of endodontic infection. However, in this case the draining sinus did not resolve subsequent to root-canal instrumentation and prolonged intracanal medication with calcium hydroxide. This may have been because of a root fracture or extraradicular infection or because the root-end amalgam filling harboured colonies of bacteria and prevented the intracanal medicament and the body's defence system from eradicating the bacteria. Additionally, the persistent inflammatory reaction may have been sustained by other radicular pathology. Histopathological examination of the tissue removed at surgery confirmed that the radicular lesion was a cyst. It is generally accepted in the endodontic literature that a radicular cyst may be classified as a true cyst, where the cystic cavity is fully enclosed by an epithelial lining and connective tissue capsule, or as a bay or apical pocket cyst that is characterized by the cyst lumen being open to the root-canal system (13, 25). The type of cyst present has a clinical bearing in as much as a pocket cyst can resolve subsequent to non-surgical root-canal treatment while a true cyst generally does not resolve (25). In this case, a true cyst was diagnosed histopathologically, confirming the decision to treat the area surgically.

Conclusion

This case highlights the importance of conducting a detailed clinical and radiographic examination and the adherence to evidence-based dentistry prior to treatment planning.

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